FEDERAL REPUBLIC OF GERMANY

Patent Application (laid open)
DE 42 01 335 A1

Int. Cl.[5]:
H 04 N 5/265

File Number: P 42 01 335.6
Filing Date: 20 January 92
Laid Open: 22 July 93

GERMAN PATENT OFFICE

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Method and arrangement for mixing an interlaced video signal with a progressive video signal

In a method and an arrangement for mixing an interlaced video signal with a progressive video signal the interlaced video signal is time-compressed by a factor corresponding to the interlace ratio, wherein blanking occurs during the intervals generated by the time compression. The time-compressed interlaced video signal is subsequently mixed with the progressive video signal.

Description

The invention builds on a method according to the genus of the main claim and relates further to an arrangement for carrying out the method.

Several parameters of television, such as line number, repetition frequency and bandwidth, represent a compromise between technical expenditure and transmission quality. In this spirit, in the currently conventional television systems the interlace method was introduced, in which, initially, a first field comprised of the odd-numbered lines is transmitted. Thereupon a second field follows with the even-numbered lines. Therewith it is, for example, possible with the European television standard, in spite of the relatively low repetition frequency of the entire frame of 25 Hz, at sufficiently great viewing distance to make effective a frequency of 50 Hz for the flicker effect and therewith to keep the flicker effect within limits.

In closed systems the bandwidth is not tied to given standards, such as for example the channel spacing of individual transmitters. In such systems use is frequently made of a progressive scan, wherein the lines of one frame are transmitted successively without interlacing. In particular computers, or their video circuits, generate such video signals, for example with a frame repetition frequency of 50 Hz and 625 lines. Herein the horizontal frequency is twice as high as that in an interlaced video signal with a field frequency of 50 Hz and 625 lines per frame.

In monitoring systems - for example for industrial installations or buildings - camera pictures and images generated by computer are frequently reproduced on screens placed side by side. The images generated by the camera are generally recorded according to the interlace method while the images (graphic images) generated by the computer are generated as progressive video signals without interlacing. For better and clearer controllability it is in many cases useful to display several different informations on a screen. For that reason mixing both signals is required.

The present invention addresses the problem of proposing a method for mixing an interlaced video signal with a progressive video signal, in which both signals are reproduced as

much as possible with the least additional expenditures and free of falsifications. In a standards conversion, which in principle is suitable for this purpose, effects occur such as, for example, vertical flutter, flicker with the frame frequency or a decrease of vertical resolution.

The method according to the invention with the characterizing features of the independent claim has the advantage that the information content of each signal to be mixed is retained and that each video signal can be reproduced on the picture screen precisely as provided by the particular standard. For mixing the time-compressed interlaced video signal with the progressive video signal several methods can be applied - for example a hard change-over switching with the aid of a mask signal, a so-called soft mixing-in or different forms of trick mixing.

An advantageous arrangement for carrying out the method according to the invention can be realized cost-effectively with structural elements available inexpensively on the market.

Through the measures listed in the dependent claims advantageous further developments and improvements of the invention specified in the independent claim are possible.

Embodiment examples of the invention are shown in the drawing in conjunction with several figures and are described in further detail in the following description. In the drawing depict:

Fig. 1 a schematic representation of an arrangement for carrying out the method according to the invention,

Fig. 2 time diagrams of video signals occurring in the arrangement of Figure 1,

Fig. 3 schematic representation of two screen images,

Fig. 4 a segment of the screen images according to Figure 3,

Fig. 5 a block diagram of an arrangement for carrying out the method according to the invention,

Fig. 6 time diagrams of signals in the arrangement according to Figure 5, and

Fig. 7 a block diagram of an embodiment example.

Identical parts in the Figures are provided with identical reference symbols.

To the arrangement according to Figure 1 the interlaced video signal IV is supplied at 1 and, via a line store 2, arrives at a first input of a mixing device 3. To a further input 4 the

progressive video signal PV is supplied. At an output 5 of the mixing device 3 the mixed video signal is available and can be supplied from here to a monitor. As the mixing device 3 can serve several mixing devices known per se. In the context of the embodiment example a mixing device is assumed which during each line reproduces alternately a portion of the interlaced video signal IV and a portion of the progressive video signal PV. The embodiment example rests, furthermore, on an interlaced video signal with 50 Hz field frequency and 625 lines per frame while the progressive video signal has a frame frequency of 50 Hz and also 625 lines per frame.

With the aid of a control circuit, not shown, the line store 2 is controlled such that a line written into the line store is read out at twice the speed. This is shown in Figure 2 and specifically in lines **a** and **b** for a first field and in lines **c** and **d** for a second field. H1, H2, etc., denote a line period relative to the interlace video signal. During the first field the time-compressed lines CV1, CV3, etc. are formed from the read-in video signal IV. During the interspaced intervals D the video signal CV is blanked, i.e. brought to a value which is reproduced as black on the picture screen.

During the second field of the interlaced video signal IV the even-numbered lines H2, H4, etc. are read into the line store and read out as lines CV2, CV4, etc. (line **d**). The generated intervals D are again blanked.

In the following the reproduction of both pictures during the first field of the interlaced video signal will be explained with reference to the picture screen shown schematically. Figures 3a and 3b only serve for the purpose of illustrating by examples the manner in which the pictures can be combined with the aid of the mixing device 3 (Fig. 1), namely such that in the case of Fig. 3a on a left portion of the picture screen the interlaced video signal IV and on a right portion of the picture screen the progressive video signal PV are reproduced. A rectangle 7 indicates that picture segment which is shown enlarged in Figure 4. In the case of Figure 3b only in a rectangle (upper right) are reproduced the progressive video signals.

The deflection units of the monitor are operated progressively, i.e. without interlacing such that the signal PV is reproduced in the conventional manner. Due to the compression factor of 0.5 and the twofold horizontal frequency of the progressive video signal compared to the interlaced video signal, in the left portion of the picture segment only the display of the odd-

numbered lines of the time-compressed interlaced video signal CV occurs, which is indicated in Figure 4 by lighter hatching. During the even-numbered lines blanking occurs.

In the subsequent field period of the interlaced video signal or frame period of the progressive video signal, corresponding to Figure 2, lines **c** and **d**, the even-numbered lines are reproduced and the odd-numbered lines are blanked. Therewith the interlaced video signal is reproduced exactly as with a monitor suitable for the reproduction of an interlaced video signal.

In the embodiment example shown as block diagram in Figure 5 the line store 2 (Fig. 1) is formed by two read-write stores 11, 12, into which alternately one line of the interlaced video signal IV is written while from the, in each case, other read-write store the signals are read out time-compressed. For that purpose two change-over switches 13, 14 are provided which are controlled by a control circuit 15 via signals SW1, SW2, which, in addition, provide write pulses WR1 and read pulses RD1 for the read-write store 11 and write pulses WR2 and read pulses RD2 for the read-write store 12. The write pulses WR1 and WR2, corresponding to the horizontal resolution, have a sufficiently high frequency of, for example, the thousand-fold of the horizontal frequency. The frequency of the read pulses RD1 and RD2 is twice as high.

The mixing device 3 in the embodiment example according to Figure 5 is implemented as a change-over switch, which is controllable with the aid of a mask signal MS supplied at 16. For generating a picture according to Figure 3a the mask signal has a rectangular shape of horizontal frequency, wherein during the left picture portion the one level (switch downward) and during the right picture portion the other level (switch upward) is assumed. For a reproduction according to Figure 3b the mask signal MS has additionally a vertical frequency component, such that only during the reproduction of signal PV in the upper right corner the change-over switch 3 is in the upper position.

Figure 6 shows the signals generated by the control circuit 15 during two time successive lines H(i) and H(i + 2) of the first field (Fig. 2), wherein the read and write pulses, due to the high frequency relative to the horizontal frequency, are only indicated. During the first line H(i) the signal SW1 is at such level that the change-over switch 13 is in the upper position. During this time write pulses WR1 are output by the control circuit 15 to the read-write store 11. During the line period H(i), further, the change-over switch 14, driven by the signal SW2, is in the lower

position. Moreover, the control circuit 15 during the first half of the line period H(i) outputs read pulses RD2 to the read-write store 12.

During the subsequent line period H(i + 2) the change-over switches 13 and 14 are in the, in each case, other position. The control circuit outputs write pulses WR2 to the read-write store 12 and during the first half of the line period H(i + 2) outputs read pulses RD1 to the read-write store 11.

In the embodiment example according to Figure 7 the mask signal MS supplied to the change-over switch 3 is derived from two mask signals MS1 and MS2, supplied to inputs 21, 22, and from the progressive video signal PV. The progressive video signal PV is supplied to an amplitude discriminator 23, whose output signal assumes a first level if the signal PV is above a threshold value SCH at an input 24. The output signal of the amplitude discriminator 23 is linked with the mask signal MS2 in an AND circuit 25. The result of this linkage is supplied, together with the mask signal MS1, to an OR circuit 26, whose output is connected to the control input of change-over switch 3.

With the aid of the device according to Figure 7 characters generated, for example, by a computer can be stamped into the interlaced signal which is otherwise not affected, wherein the character signals generate via the amplitude discriminator 23 a mask signal encompassing the characters. Through the mask signal MS2 in connection with the AND circuit 25 this process is limited to a predetermined portion of the picture. Through the mask signal MS1 and the OR circuit 26, additionally, change-over switching, independent of the characters, to the progressive video signal is made possible.

Patent Claims

1. Method for mixing an interlaced video signal with a progressive video signal, **characterized in that** the interlaced video signal is time-compressed by a factor corresponding to the interlacing ratio, wherein, during the intervals generated by the time compression, blanking occurs, and that the time-compressed interlaced video signal is mixed with the progressive video signal.

2. Method as claimed in claim 1, characterized in that the interlacing ratio is 1:2 and the factor is 0.5.

3. Arrangement for carrying out the method as claimed in claim 1, characterized in that for the time compression two read-write stores (11, 12) are provided, into which alternately one line of the interlaced video signal is written and read out again at the twofold speed.

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3 drawing sheets enclosed
